

10 Gbps Single Mode Transceiver



SFP+, Duplex LC Connector, 1310nm DFB LD for Single Mode Fiber, RoHS Compliant
Digital Diagnostics Functions



Features

- 1310nm uncooled DFB LD
- Receiver limiting amplifier
- Data Rate: 8.5Gbps to 11.3Gbps, NRZ
- RoHS Compliant and Lead-free
- Compliant to SFP+ Electrical MSA SFF-8431
- Compliant to SFP+ Mechanical MSA SFF-8432
- Compliant with specifications for IEEE-802.3ae 10GBASE-LR/LW at 10.3125 Gbps
- Compliant with specifications for Fibre Channel 1200-SM-LC-L at 10.51875 Gbps
- Compliant with specifications for Fibre Channel 800-SM-LC-L at 8.5 Gbps
- Digital Diagnostic Monitoring Interface
- Duplex LC Connector
- Transmission distance up to 10km
- Low power consumption < 1W
- Compliant with Laser Class 1 IEC / CDRH

Applications

- 10G Fibre Channel Links
- 10Gigabit Ethernet Links
- 8.5 Gb/s Fibre Channel Links

Description

The CT-A000TPP-NB4L-D from Coretek Opto Corp. is a high performance, optimum heat dissipation and excellent electromagnetic shielding module for serial optical data communication applications specified for single mode of data rate 10.3125 Gb/s. The module is intended for multimode fiber, operates at a nominal wavelength of 1310nm and complies with Multi-Source Agreement (MSA) SFP+. Each module is integrated digital diagnostics functions via an I²C serial interface.

The module is a duplex LC connector transceiver designed to provide 10 Gigabit Ethernet compliant link at 10.3 Gb/s and Fibre Channel compliant link at 8.5 and 10.5 Gb/s intermediate reach applications. The characteristics are performed in accordance with IEEE802.3ae and Fibre Channel Physical Interface.

EMC

Most equipment utilizing high-speed transceivers will be required to meet the following requirements:

- 1) FCC in the United States
- 2) CENELEC EN55022 (CISPR 22) in Europe

To assist the customer in managing the overall equipment EMC performance, the transceivers have been designed to satisfy FCC class B limits and provide good immunity to radio-frequency electromagnetic fields.

Eye Safety

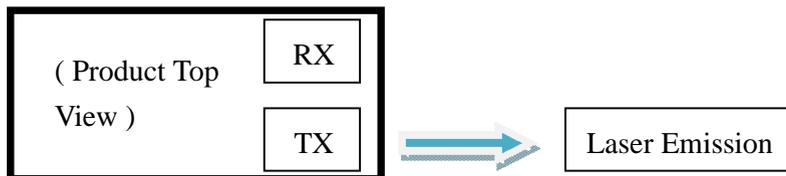
This laser based single mode transceiver is a Class 1 product. It complies with IEC 60825-1 Ed.2: 2007 and FDA performance standards for laser products (21 CFR 1040.10 and 1040.11) except for deviations pursuant to Laser Notice 50, dated June 24, 2007.

CLASS 1 LASER PRODUCT

DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS

Caution: use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation.

Note: All adjustments have been made at the factory prior to shipment of the devices. No maintenance or alteration to the device is required. Tampering with or modifying the performance of the device will result in voided product warranty. Failure to adhere to the above restrictions could result in a modification that is considered an act of “manufacturing”, and will require, under law, recertification of the modified product with the U.S. Food and Drug Administration (ref. 21 CFR 1040.10 (i)).



Wavelength > 1310 nm
Maximum total output power < 15.6 mW / 11.9 dBm
(as defined by IEC: 7 mm aperture at 70 mm distance)
Beam divergence (full angle) / NA (half angle) 11° / 0.1 rad

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Product Information

Model Number	Wavelength	Output Power	Sensitivity	Distance
CT-A000TPP-NB4L-D	1310 nm	-8.2 ~ +0.5 dBm	≤ -12.6 dBm	10km

ABSOLUTE MAX RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Storage Temperature	T _s	-40	85	°C	
Supply Voltage	V _{CC}	-0.5	3.6	V	
Relative Humidity	RH	0	85	%	

OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Case Operating Temperature	T _A	0		70	°C	
Supply Voltage	V _{CC}	3.14	3.30	3.47	V	
Supply Current	I _{CC}			300	mA	
Data Rate		8.5	10.3125	11.3	Gb/s	

ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Transmitter					
Data Input Differential Voltage	V _{ID}	180	700	mV	
Tx_Disable Input Voltage - Low	V _{IL}	-0.3	0.8	V	
Tx_Disable Input Voltage - High	V _{IH}	2.0	V _{CC} + 0.3	V	
Tx_Fault Output Voltage - Low	V _{OL}	-0.3	0.4	V	
Tx_Fault Output Current - High	I _{OH}	-50	37.5	μA	1
Receiver					
Data Output Differential Voltage	V _{OD}	300	850	mV	2
Rx_LOS Output Voltage - Low	V _{OL}	-0.3	0.4	V	
Rx_LOS Output Current - High	I _{OH}	-50	37.5	μA	1
SDA, SCL - Low	V _{IL}	-0.3	V _{CC} × 0.3	V	
SDA, SCL - High	V _{IH}	V _{CC} × 0.7	V _{CC} + 0.5	V	

TRANSMITTER ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
Optical Output Power (average)	P _o	-8.2		0.5	dBm	
Optical Output Power	OMA	-5.2			dBm	
Center Wavelength	λ _c	1260		1355	nm	
Spectral Width (-20dB)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter OFF Power	P _{off}			-30	dBm	
Transmitter Dispersion Penalty	TDP			3.2	dB	
Extinction Ratio	ER	3.5			dB	
Relative Intensity Noise(OMA)	RIN			-128	dB/Hz	

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RECEIVER ELECTRO-OPTICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
Maximum Input Optical Power	P_{max}	0.5			dBm	
Receiver Sensitivity (OMA)	P_{min}			-12.6	dBm	3
Stressed Receiver Sensitivity (OMA)	P_{min}			-10.3	dBm	
LOS of Signal - Deasserted	P_D			-17	dBm	
LOS of Signal - Asserted	P_A	-30			dBm	
LOS of Signal - Hysteresis	Hys	0.5			dB	
Reflectance	RL			-12	dB	
Operating Wavelength	λ	1260		1600	nm	

Notes:

1. Measured with a $4.7k\Omega$ load pulled up to V_{cc_Host}
2. Into 100Ω differential termination
3. Measured with $2^{31}-1$ PRBS at $BER < 10^{-12}$

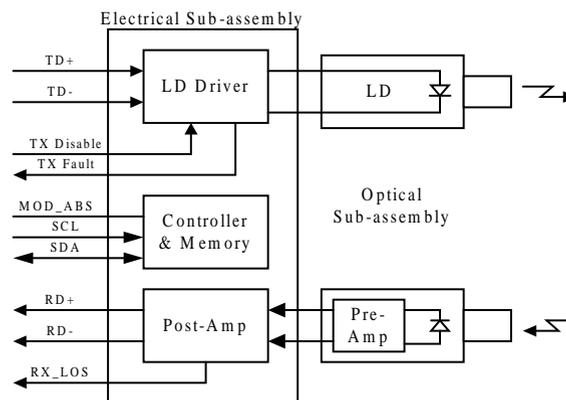
TIMING CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNIT	NOTE
TX_DISABLE Assert Time	t_{off}			10	μs	
TX_DISABLE Negate Time	t_{on}			2	ms	
Time to initialize, include reset of TX_FAULT	t_{init}			300	ms	
TX_FAULT from fault to assertion	t_{fault}			100	μs	
TX_DISABLE time to start reset	t_{reset}	10			μs	
Receiver Loss of Signal Assert Time (off to on)	t_{A,RX_LOS}			100	μs	
Receiver Loss of Signal Assert Time (on to off)	t_{D,RX_LOS}			100	μs	

DIGITAL DIAGNOSTIC MONITOR ACCURACY

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Transceiver Temperature	T	-3	+3	$^{\circ}C$	
Power Supply Voltage	V	-3	+3	%	
TX Bias Current	Tx_I	-10	+10	%	
TX Optical Power	Tx_PWR	-2	+2	dB	
RX Optical Power	Rx_PWR	-3	+3	dB	

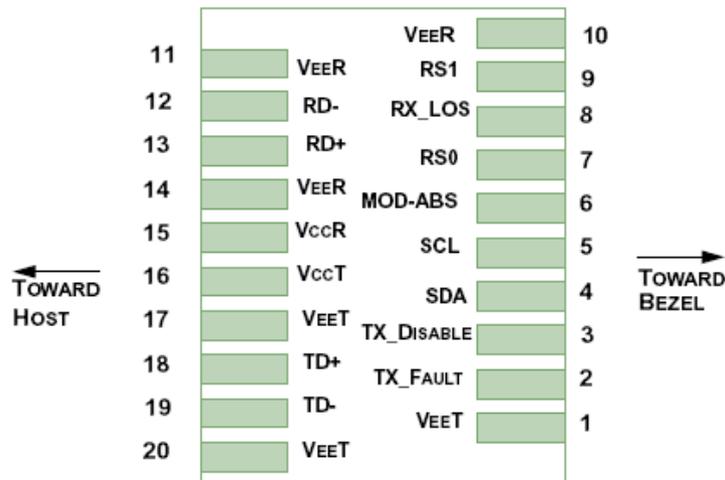
BLOCK DIAGRAM OF TRANSCEIVER



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PIN OUT DIAGRAM OF TRANSCEIVER



PIN OUT TABLE

Pin	Symbol	Logic	Functional Description	Note
1	V _{EE} T		Transmitter Ground	1
2	TX_FAULT	LVTTL-O	Transmitter Fault Indication	2
3	TX_DISABLE	LVTTL-I	Transmitter Disable – Module disables on high or open	3
4	SDA	LVTTL-I/O	Two wire serial ID interface data line	4
5	SCL	LVTTL-I/O	Two wire serial ID interface clock	4
6	MOD-ABS		Module absent, connect to VeeT or VeeR in the module	5
7	RS0		No connection required	
8	RX_LOS	LVTTL-O	Loss of Signal	2
9	RS1		No connection required	
10	V _{EE} R		Receiver Ground	1
11	V _{EE} R		Receiver Ground	1
12	RD-	CML-O	Inverse Received Data Out	
13	RD+	CML-O	Received Data Out	
14	V _{EE} R		Receiver Ground	1
15	V _{CC} R		Receiver Power	
16	V _{CC} T		Transmitter Power	
17	V _{EE} T		Transmitter Ground	1
18	TD+	CML-I	Transmitter Data In	
19	TD-	CML-I	Inverse Transmitter Data In	
20	V _{EE} T		Transmitter Ground	1

Notes:

1. Module ground pins GND are isolated from the module case and chassis ground within the module.
2. This is an open collector/drain output that on the host board requires a 4.7-10 k Ω pullup resistor to Vcc_Host.
3. This is an input contact with a 4.7-10k Ω pullup to Vcc inside the module.
4. Two-wire serial interface clock and data lines require an external pullup resistor dependant on the capacitance load.
5. This is a ground return that on the host board requires a 4.7-10 k Ω pullup resistor to Vcc_Host.

